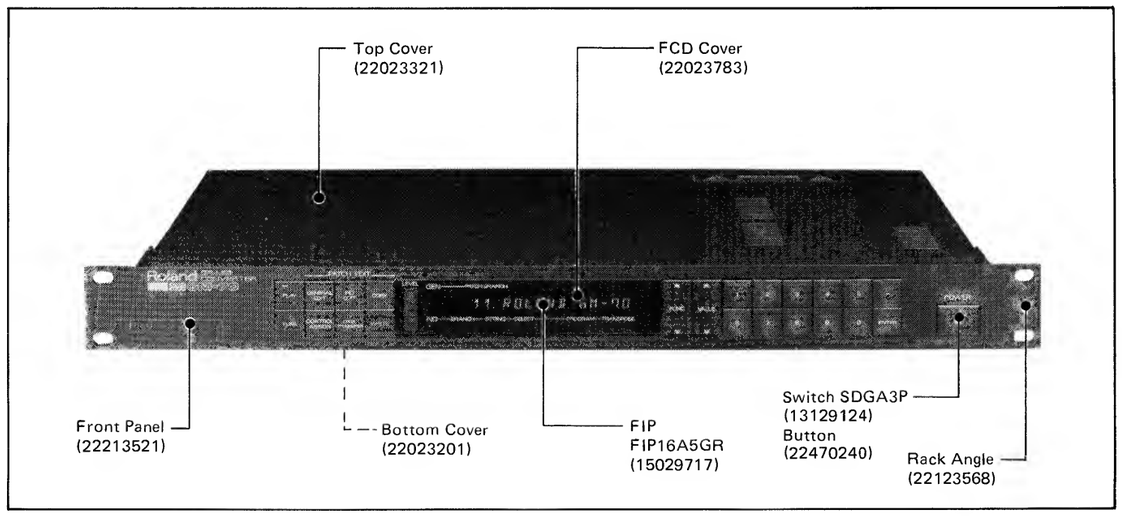
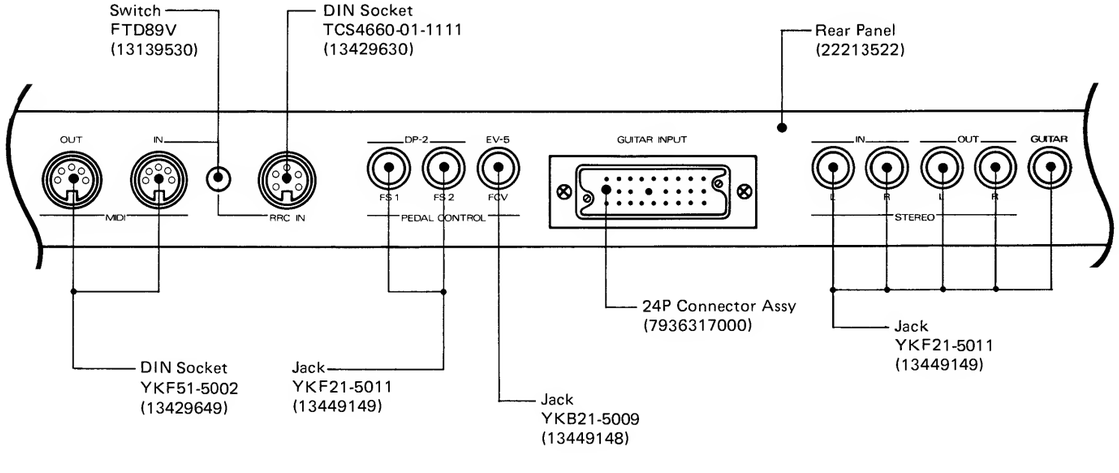
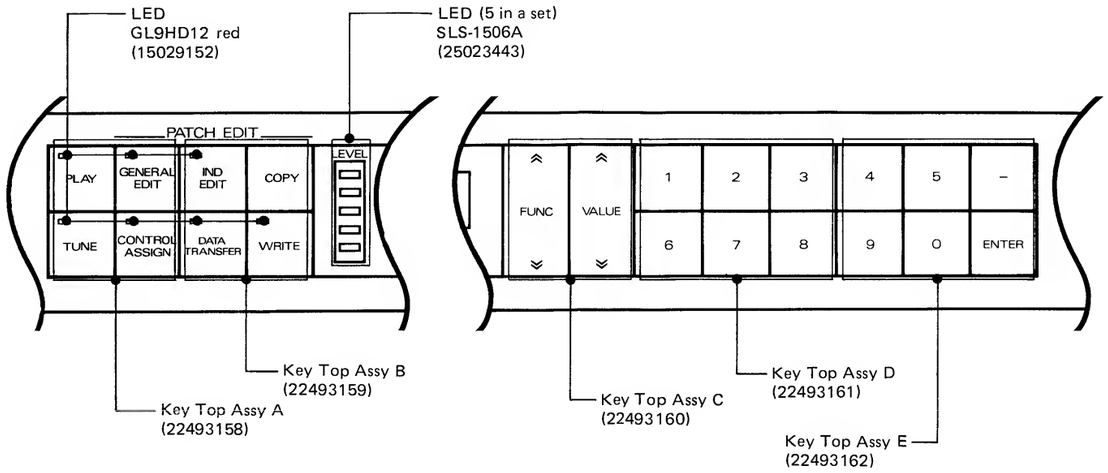
GM-70 SERVICE NOTES *First Edition*

SPECIFICATIONS

OUTPUT	:	GUITAR 8KΩ MIX L 8KΩ R 8KΩ
INPUT	:	SYNTH L 51KΩ R 51KΩ
RRC IN	:	FC-100 only
POWER CONSUMPTION	:	100V 19W 120V 22W 220V 22W 240V 22W
DIMENSIONS	:	482 (W) x 276 (D) x 44 (H) mm 19 (W) x 10-7/8 (D) x 1-3/4 (H) in.
WEIGHT	:	4 kg 8 lb. 13 oz.
ACCESSORIES	:	CONNECTION CORD LP-25 (Part No. 23430675S0) x 1 MIDI CABLE 2.5M (Part No. 23485135) x 1 OWNER's MANUAL x 1
OPTIONS	:	FOOT CONTROLLER FC-100 EXPRESSION PEDAL EV-5 CARRYING CASE







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PARTS LIST

PANEL, CASING

22023321	Top Cover	
22023201	Bottom Cover	
22193896	Front Holder	
22193897	Side Holder L	
22193898	Side Holder R	
22193899	P.T. Holder	
22193900	Power SW Holder	
22213521	Front Panel	
22213522	Rear Panel	
22123568	Rack Angle	
22023783	FCD Cover	

BUTTON

22493158	Key Top Assy A	
22493159	Key Top Assy B	
22493160	Key Top Assy C	
22493161	Key Top Assy D	
22493162	Key Top Assy E	
2247024000	Button blk	POWER

SWITCH

13139530	FTD89V (toggle)	RRC IN-MIDI IN
13129733	SKHHBE (tact)	
13129124	SDGA3P (push)	POWER

JACK, SOCKET

13449149	YKF21-5011	Jack (MONO) INPUT, OUTPUT, GUITAR, FS-1, FS-2	
13449148	YKF21-5009	Jack (STEREO)	FCV
13429649	YKF51-5002	DIN Socket	MIDI
13429630	TCS4660-01-1111	DIN Socket	RRC IN

POWER TRANSFORMER

22453461N0	245-461N0	100,117V
22453462D0	245-462D0	220,240V

PCB ASSY

7936310000	Main Board	(pcb 22923380)
7936314000	Switch Board	(pcb 22923382)
7936308100	Power Supply Board	(pcb 22923381)
7936316000	EMI Board (w/24P connector)	(pcb 22923433)
		See CHANGE INFORMATION

TRANSISTOR

15119108	2SA798G	
15129613	2SD1207S	
15129169	2SC945R	
15139118	2SK-30AGR	FET
15129164	DTC114ES-TP	w/built-in bias resistors
15119141	DTA114ES-TP	w/built-in bias resistors

DIODE

15019126	1SS-133-77		
15019323	04AZ9.1X	zener	
15019325	04AZ39R	zener	
15029152	GL9HD12	LED red	
25023443	SLS-1506A	LED	LEVEL METER
15019243	1B4B1	rectifier bridge	

FIP

15029717	FIP16A5GR	Fluorescent Indicator Panel
22263383	FIP Cushion	
22193938	FIP Holder	

COIL

12449229	FKOB-160MH15	Line Filter
12449251	244-251	FIP Driver

CRYSTAL

12389746	HC49/V 12MHz	
12389738	CSB400P	

IC

15179246	8095-90	CPU
15179201	μPD7537C-104	4-Bit NMOS CPU
15229845	MSM75H016-SS	Gate Array
15179803	M52M27C128K	EP ROM A
15179804	M52M27C128K	EP ROM B
15179334	TC5564PL	SRAM
15219139	PST518A	Reset
15229706	TLP552	Optoisolator
15189154	TL064CN	OP Amp
15189102	4558DD	OP Amp
15189197	5532D	OP Amp
15169551B0	M74HC174P	Hex D Flip-Flops with Clear
15169539B0	M74HC139P	Dual 2-to-4 Line Decoder
15169550B0	M74HC138P	3-to-8 Line Decoder
15169554B0	M74HC374P	3 State Octal D-type Flip-Flop
15169543B0	M74HC373P	3 State Octal D-type Latch
15169552B0	M74HC245P	Octal 3 State Transceiver
15169513B0	M74HC74P	Dual D Flip-Flop with Preset and Clear
15169549B0	M74HC32P	Quad 2-Input OR Gate
15169515B0	M74HC00P	Quad 2-Input NAND Gate
15159129H0	HD14053BP	Triple 2-Channel Multiplexer/ Demultiplexer
15159113Z0	HD14051B	Single 8-Channel Multiplexer/ Demultiplexer
15159505	TC40H004P	Hex Inverter
15199137	AN7805F	Voltage Regulator
15199133	AN7815F	Voltage Regulator
15199134	AN7915F	Voltage Regulator

LITHIUM BATTERY

12569252	CR2450 3V 500 μAH

AC CORD, INLET

13439801W0	VFF 2.5M	Cord	100V
12369504	SR-4N-4	Bushing	100V
22193932	219-932	Holder	100V
13439812F0	JC-704-J01	Cord Set	117V
13439813F0	EC-210-J06	Cord Set	220V
23495110	5722 660 4606	Cord Set	240V
13429710	2P-PA126	Inlet	117/220V
13429708	3P-CM-3	Inlet	240V

RESISTOR ARRAY

13919308	RMLS6-103J	10KΩ x 6
13919310	RMLS8-103J	10KΩ x 8

CAPACITOR

13519301	DD312-957BC104Z25V	0.1μ/25V	
13659204	ECES1CU472D	4700μ/16V	Power Supply Board
1363919450	35MV1000	1000μ/35V	Power Supply Board
13529104	DE7150F472MVA1		Power Supply Board

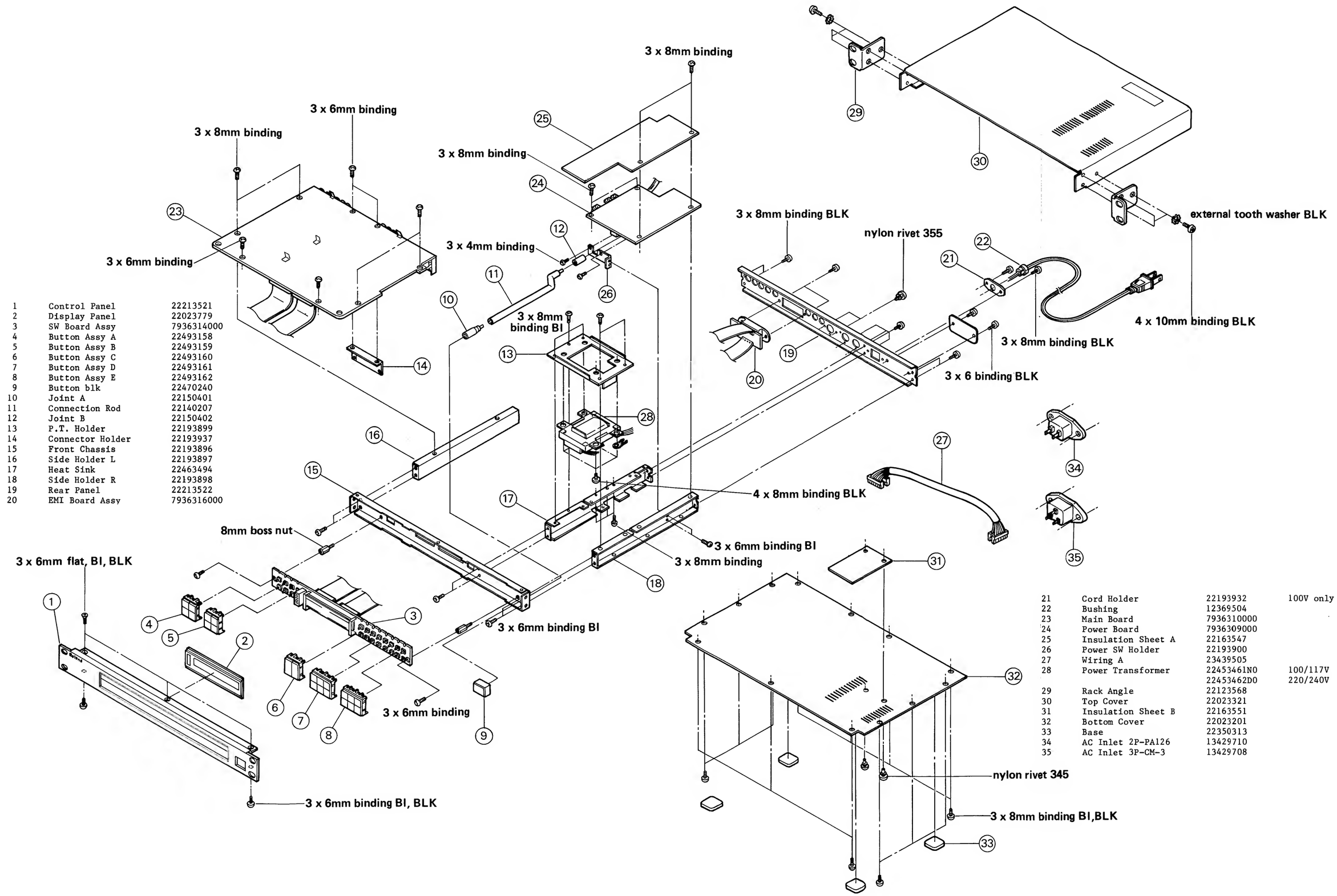
CONNECTOR

7936317000	24P Connector Assy (w/sumi card)		See CHANGE INFORAMTION
13439315	CF-034		SW Board, Main Board
13439265	5267-08A	8P	Power Supply, Main Board
13439306	5566-06A	6P	Power Supply Board

MISCELLANEOUS

13429527	ICC-OS-028-360T	IC Socket 28P
12449266	BL01 RN-A62	
12449266	BL01RN1-A62	Ferrite beads
13529110	DSS310-55B222M	EMI Filter
22463494	246-494	Heat Sink
22193937	Connector Holder	G-24 BUS
23453169	Contact Chip	
22023332	DIN Cover	
22163547	Spacer A	
22163551	Spacer B	

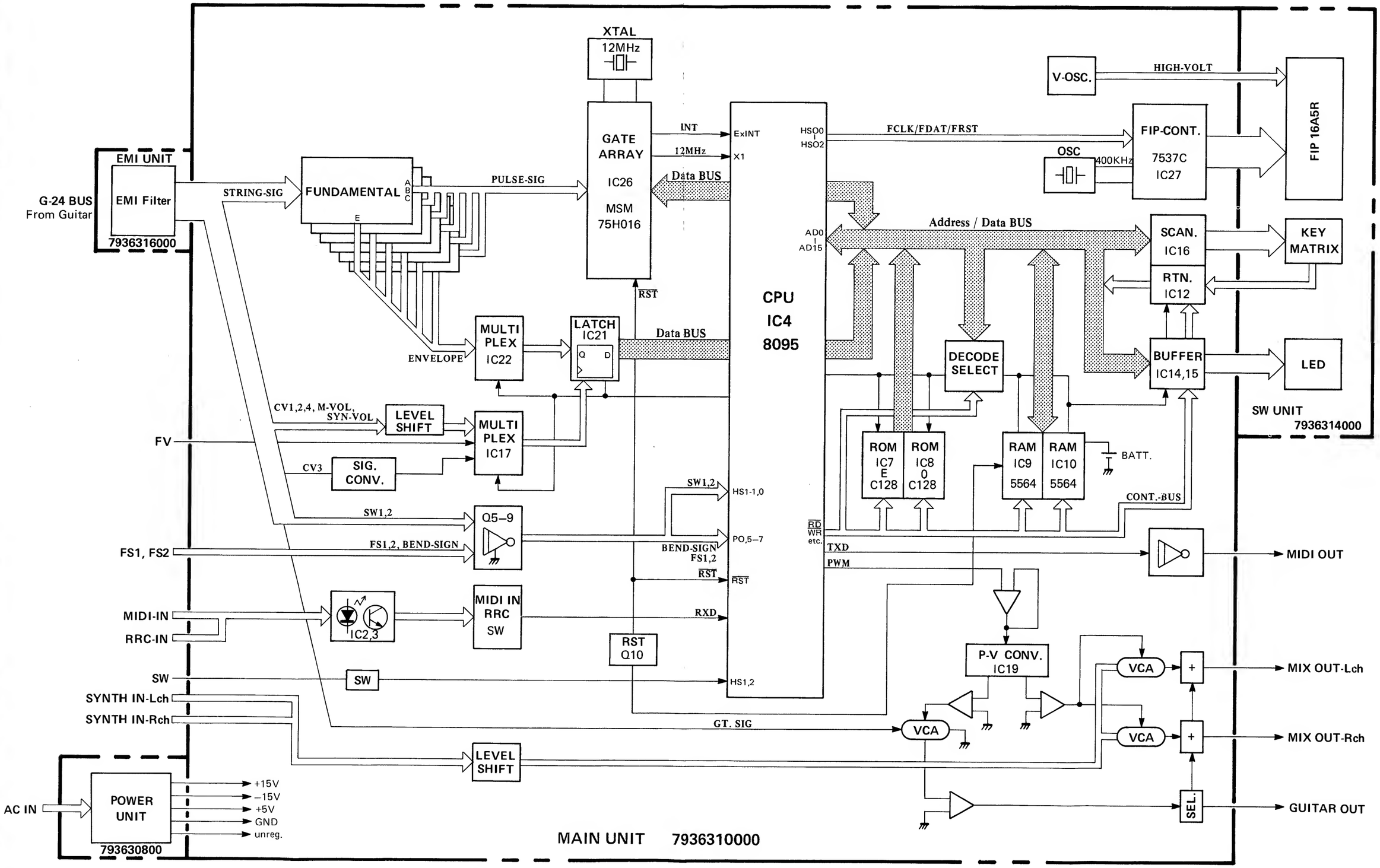
EXPLODED VIEW



1	Control Panel	22213521
2	Display Panel	22023779
3	SW Board Assy	7936314000
4	Button Assy A	22493158
5	Button Assy B	22493159
6	Button Assy C	22493160
7	Button Assy D	22493161
8	Button Assy E	22493162
9	Button blk	22470240
10	Joint A	22150401
11	Connection Rod	22140207
12	Joint B	22150402
13	P.T. Holder	22193899
14	Connector Holder	22193937
15	Front Chassis	22193896
16	Side Holder L	22193897
17	Heat Sink	22463494
18	Side Holder R	22193898
19	Rear Panel	22213522
20	EMI Board Assy	7936316000

21	Cord Holder	22193932	100V only
22	Bushing	12369504	
23	Main Board	7936310000	
24	Power Board	7936309000	
25	Insulation Sheet A	22163547	
26	Power SW Holder	22193900	
27	Wiring A	23439505	
28	Power Transformer	22453461N0	100/117V
		22453462D0	220/240V
29	Rack Angle	22123568	
30	Top Cover	22023321	
31	Insulation Sheet B	22163551	
32	Bottom Cover	22023201	
33	Base	22350313	
34	AC Inlet 2P-PA126	13429710	
35	AC Inlet 3P-CM-3	13429708	

BLOCK DIAGRAM



BRIEF DESCRIPTION

A string signal from the divided pickup reaching FUNDAMENTAL section on the main board is first transformed into 4 signals (see Figs. 1 and 2).
. A' and B' representing the fundamental of opposite polarity.
. C representing harmonics
. E to be used for determining a contour of the string sound.
The signals (pulses) A', B' and C are fed to IC26, gate array while the signal E is to IC4, CPU.

The following signals are fed to the CPU through level processing stages:
Signals from the guitar controller—CV1, CV2, CV4, M-VOL and SYN-VOL—through the level shifter. SW1, SW2, FS-1, FS-2 and BEND SIGN—through Qs5—9.

The IC26, gate array determines the pitch of the string based on the fundamental and harmonics pulses. The gate array sends this pitch data to the CPU after issuing an interrupt.

ブロック説明

ディバイデッドピックアップからの弦信号はFUNDAMENTALのフィルター回路に入力されます。

FUNDAMENTAL では入力された弦信号を基音成分と高調波成分とに分離、それぞれパルス信号（PULSE SIG）に変換し、ゲートアレイ IC26（MSM75H016）に送ります。またエンベロープ波形（ENVELOPE）も検出し、CPU IC4（8095）へ送ります。

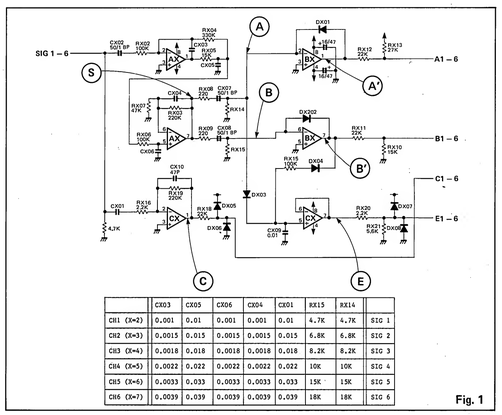
FUNDAMENTAL 回路部と各ポイントにおける波形を Fig. 1及び Fig. 2に示します。

ギターコントローラからのCV1，2，4，M-VOL，SYN-VOLの各信号はレベルシフト回路を通じCPUに読み込まれます。またSW1，2，FS1，2，BEND SIGNの各信号はQ5～9によりレベル調整されCPUに読み込まれます。

ゲートアレイ（MSM75H016）は基音成分と高調波成分から弦のピッチを計算し割り込み要求によりCPUへ送ります。

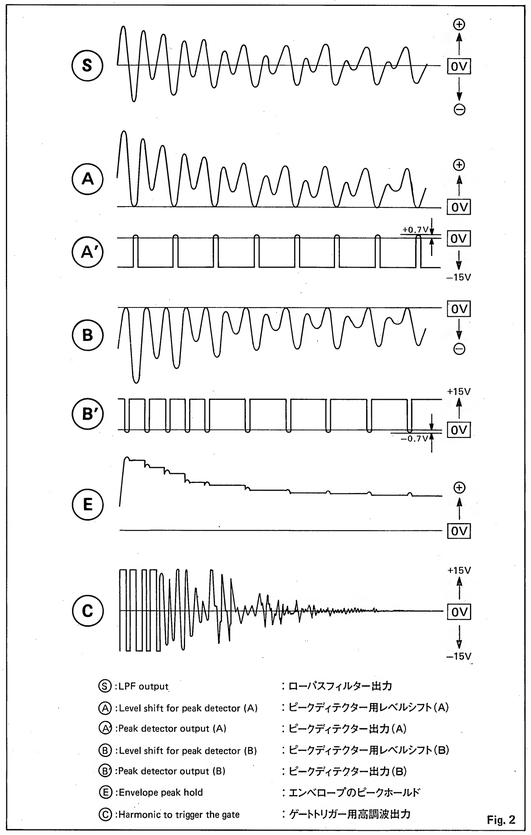
CPUはゲートアレイからのデータ及びギターコントローラの各信号を基にMIDI信号を作りMIDI OUTから出力します。

SW BOARDのKEY SWは6×4のキーマトリクスを介して、CPUに読み込まれます。またLEDは BUFFERにラッチされているCPUからのDATAにより点灯、消灯します。



	CX03	CX05	CX06	CX04	CX01	RX15	RX14	
CH1 (X=2)	0.001	0.01	0.001	0.001	0.01	4.7K	4.7K	SIG 1
CH2 (X=3)	0.0015	0.015	0.0015	0.0015	0.015	6.8K	6.8K	SIG 2
CH3 (X=4)	0.0018	0.018	0.0018	0.0018	0.018	8.2K	8.2K	SIG 3
CH4 (X=5)	0.0022	0.022	0.0022	0.0022	0.022	10K	10K	SIG 4
CH5 (X=6)	0.0033	0.033	0.0033	0.0033	0.033	15K	15K	SIG 5
CH6 (X=7)	0.0039	0.039	0.0039	0.0039	0.039	18K	18K	SIG 6

Fig. 1



Ⓢ :LPF output ：ローパスフィルター出力
Ⓐ :Level shift for peak detector (A) ：ピークディテクター用レベルシフト(A)
Ⓐ' :Peak detector output (A) ：ピークディテクター出力(A)
Ⓑ :Level shift for peak detector (B) ：ピークディテクター用レベルシフト(B)
Ⓑ' :Peak detector output (B) ：ピークディテクター出力(B)
Ⓔ :Envelope peak hold ：エンベロープのピークホールド
Ⓒ :Harmonic to trigger the gate ：ゲートトリガー用高調波出力

Fig. 2

CHANGE INFORMATION

ROM Version

The latest version number as of March 1987 is 1.02.
Refer to table A for updating.

変更案内

ROM バージョン

1987年3月現在、ROM（A）及び（B）の最新は共に1.02です。詳細はTable A を参照して下さい。

ROM(A),(B) Version No.	Serial No.	What is cured	改善された症状
1.00	Prior to 740870		
1.01	740870UP	**CONTROL ASSIGN DISPLAY** Change C94, SELLES DEPTH to CELLES DEPTH. **FOOT VOLUME DATA** MIDI Control Change data representing the maximum value of the foot volume (connected to GM-70) sometimes does not reach 7FH. A receiving unit arranged to recognize 7FH as a "Switch On" fails to toggle the switching. **CHOKING IN POLY MODE** Assume that only one string is plucked, choked (MIDI Bender Change is issued) and then muted at a high pitch, a receiving unit may have a sound whose pitch is falling down toward the original during release period. (Longer the release time, the more notable.) This is because Bender Change (for original pitch) as well as NOTE OFF are transmitted when muting.	• コントロールアサインのC94〔セレスデプス〕のディスプレイ表示を"SELES"から"CELES"へ訂正 • フットボリウムを最大の位置に踏み込んでもコントロールチェンジ情報のデータが最大（7FH）にならない事がある。従って、フットボリウムにコントロールチェンジ情報のスイッチ操作のものを割り当てて使用しようとした場合、このデータの最大値（7FH）をスイッチ ONと認識する機器では、切り替わらない事がある。 • POLYモードで使用時、ある弦のみチョーキングをかけ（MIDI OUTにベンダーチェンジ情報を出力）音程が上がった状態でその弦の振動を止めると、（MIDI OUTにノートオフの情報と共にベンダーチェンジ情報も出力されてしまうため）音程が下がってしまう。 （注意：受信側の音源の音色がリリースタイムの長いものである場合、この症状がでます。）
1.02	752450UP	**SOFTWARE RESET** Unreliable reset feature at MIDI initialization to MONO or POLY. The phenomenon is distinguishable by a) no corresponding sound to a picking at the receiving unit and b) continuously lighting level LED(s). With Ver. 1.01 and below the problem is cured by hardware resetting of 1MΩ being connected across IC4 pin 12 and the ground. Note that this resistor is no longer required upon updating the software.	• ソフトウェアのリセット動作が不安定の為（モノまたはポリモードの）イニシャライズ操作を行うと、ギターを弾いても接続先の音源が鳴らない（ノートメッセージが出力されない）事がある。またこの症状が出た時、レベル LED は点灯したままになる。 （注意：この変更が行なわれる前にメインボードIC4 12番ピンとGNDとの間に1MΩの抵抗を追加し、ハードウェアで強制的にリセットをかけるように変更しているものがあります。これらのものについては、1MΩを削除し、本バージョンのものに差替えて下さい。）

Table A

HARDWARE

1. Replacing primary fuse with a jumper
EFF SN 740870—UP
Now, fusing function relies on the fuse that resides in the power transformer.

2. Meeting VDE and FCC requirements
EFF SN 753118—UP
1) Adding capacitor with reconnection of IC pin arrangements (Fig. A)
2) Eliminating EMI board and ferrite beads
. Remove ferrite beads F1—6 and F8—16, instead use jumpers.
. Making EMI board obsolete
The 24P Connector mounted on the EMI board is separated to make a sole device called 24P Connector Assy (P.N. 7936317000). The main board is relaid-out to accommodate the new connection (Fig. B)

ハードウェア

1．1次側電源ヒューズ削除、ジャンパー追加
実施 製番740870から
理由 不必要のため

2．VDE、FCC対策
実施 製番753118から
1）コンデンサ及びジャンパー追加、パターンカット（Fig. A参照）
2）一部部品削除、変更及びパターン変更
• F1—6，F8—16を削除し、ジャンパーでショート
• EMIボード完成品〔24Pコネクタ付〕を削除し、代わりに24Pコネクタ完成品（7936317000）に変更。またこれに伴ないメインボードのパターン変更（Fig. B参照）

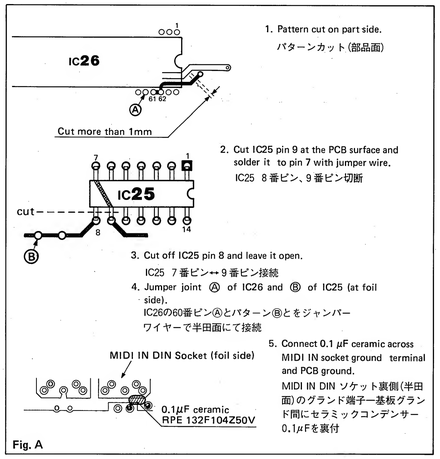


Fig. A

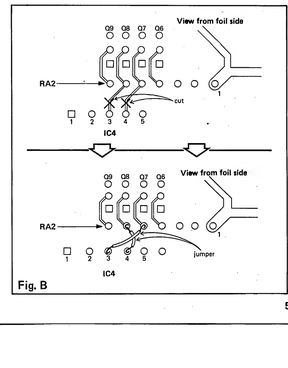


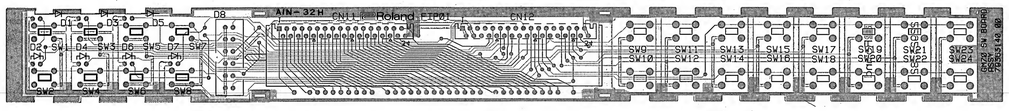
Fig. B

NOTE
24P CONNECTOR REPLACEMENT
Replacement order for EMI board w/24P connector (on products SN prior to 753118) is filled with 24P connector Assy only. When replacing, reconnect patterns on the main board as shown in Fig. B.

24Pコネクタ部分を交換する時の注意
補修用パーツは24Pコネクタ完成品で供給されます。修理品にEMIボード完成品（24Pコネクタ付）が実装されている場合（製番753118未満のもの）は、これを24Pコネクタ完成品に交換し、必ずメインボードのパターン変更を行なって下さい。（Fig. B参照）

SWITCH BOARD
ASSY 79363140
(pcb 2292338200)

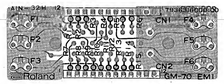
Viewing at FIP



EMI BOARD
ASSY 7936316000
(pcb 2292343300)

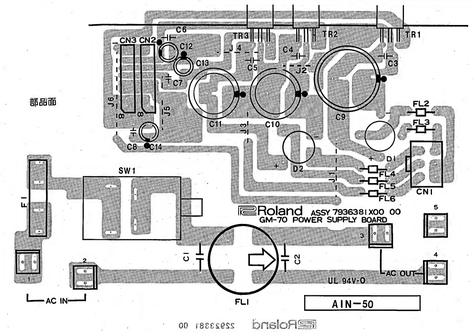
Mounted only on the products
SN prior to 753118

Viewing at EMI Filter.



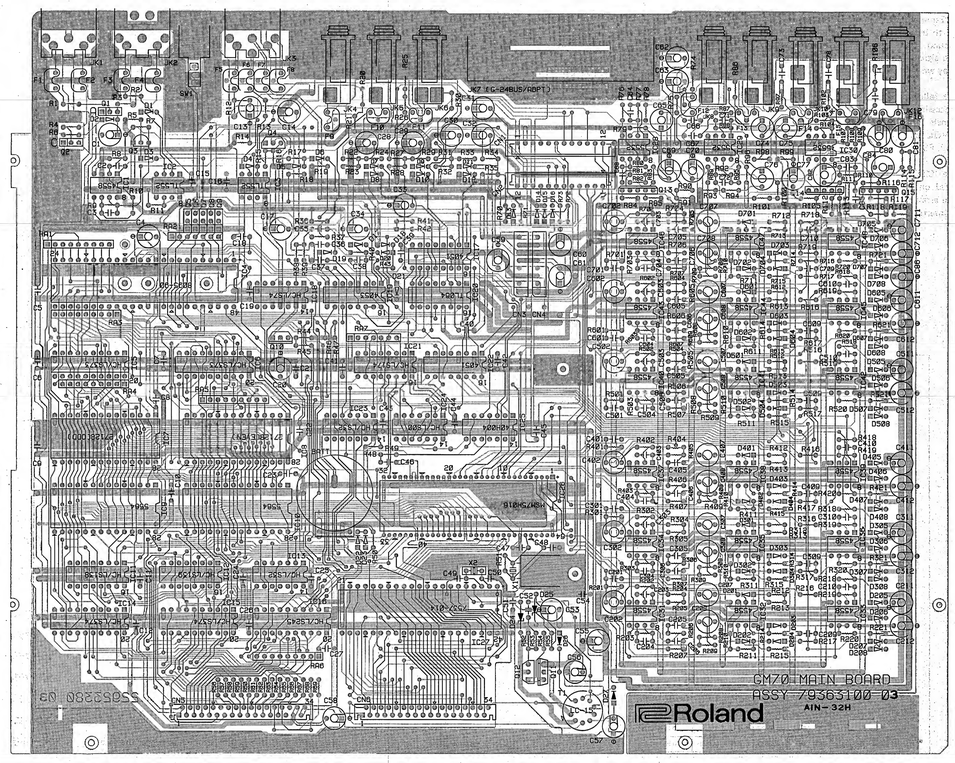
POWER SUPPLY BOARD
ASSY 7936308000
(pcb 2292338100)

View from component side



MAIN BOARD
ASSY 79363100
(pcb 2292338003)

View from component side



ADVARSEL!
Lithiumbatteri. Eksplosionsfare.
Udskiftning må kun foretages af en sagkyndig, og som beskrevet i servicemanual.

Lithium batteri må kun udskiftes med samme type og fabrikat.

VARNING!
Lithiumbatteri. Explosionsrisk.
Får endast bytas av behörig servicetekniker.
Se instruktioner i servicemanualen.

Lithium batteri för endast ersättes med samme typ och fabrikat.

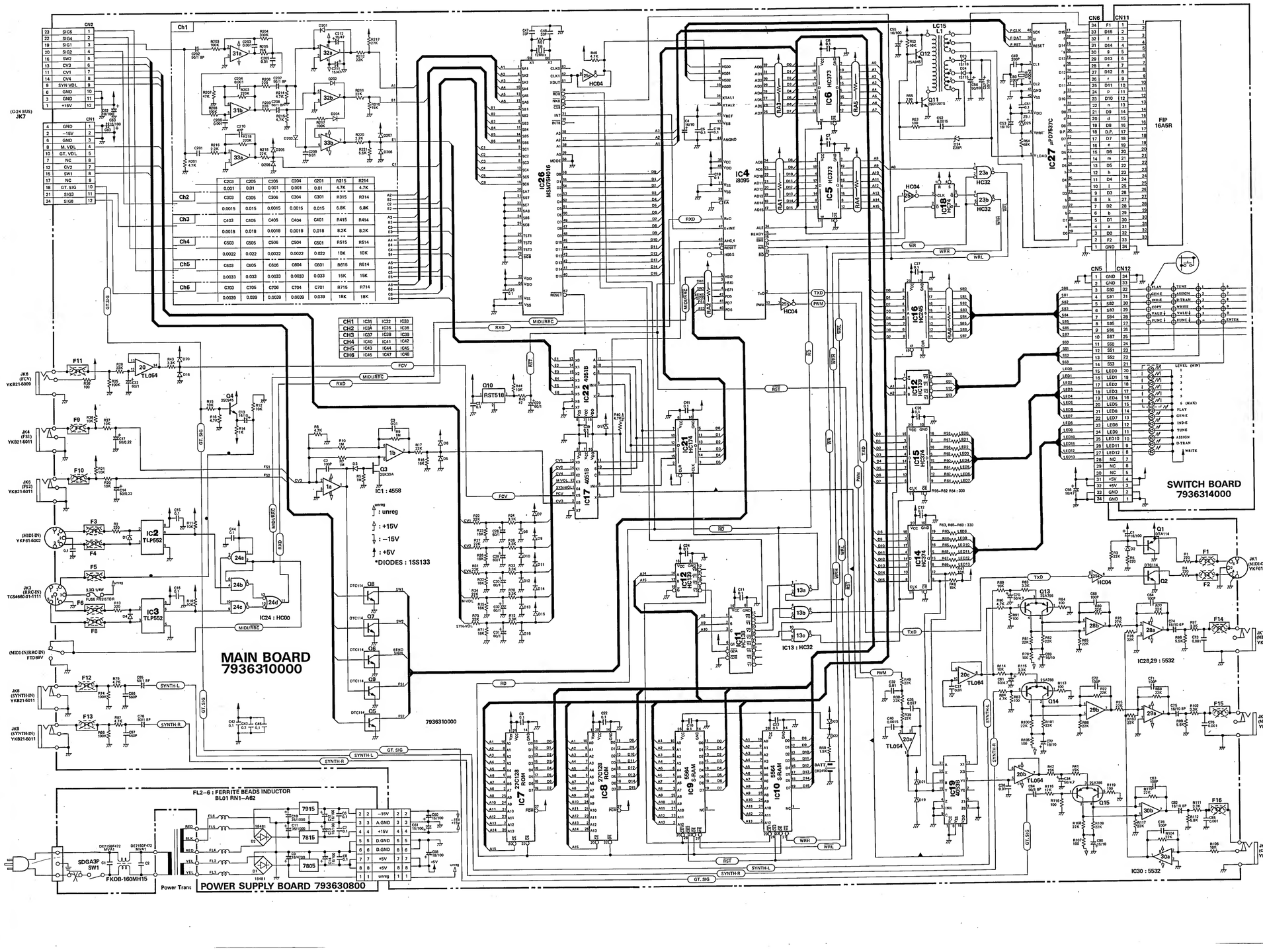
ADVARSEL!
Lithiumbatteri. Fare for eksplotion.
Må bare skiftes av kvalifisert tekniker som beskrevet i servicemanualen.

Lithium batteri må kun utskiftes med samme type og fabrikat.

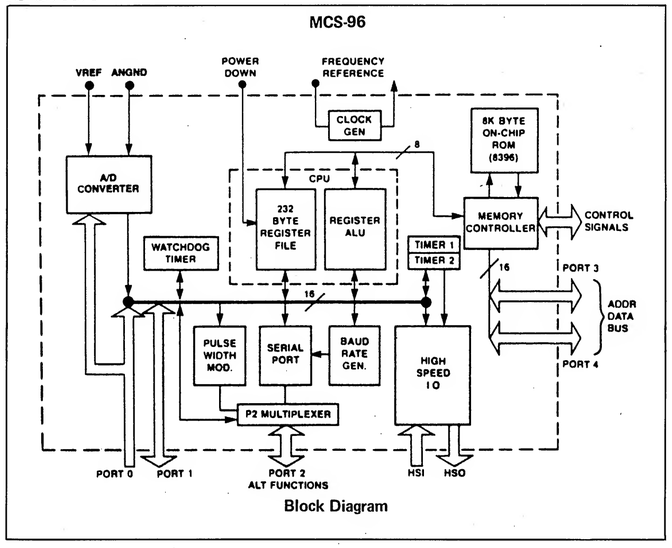
VAROITUS!
Lithiumpariston. Räjähdysvaara.
Pariston saa vaihtaa ainoastaan alan ammottimies.

Kun vaihat lithium pariston KÄYTÄ saman valmistajan samaa tyyppiä.

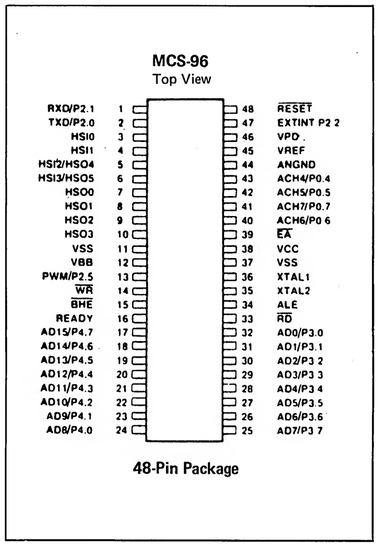
CIRCUIT DIAGRAM



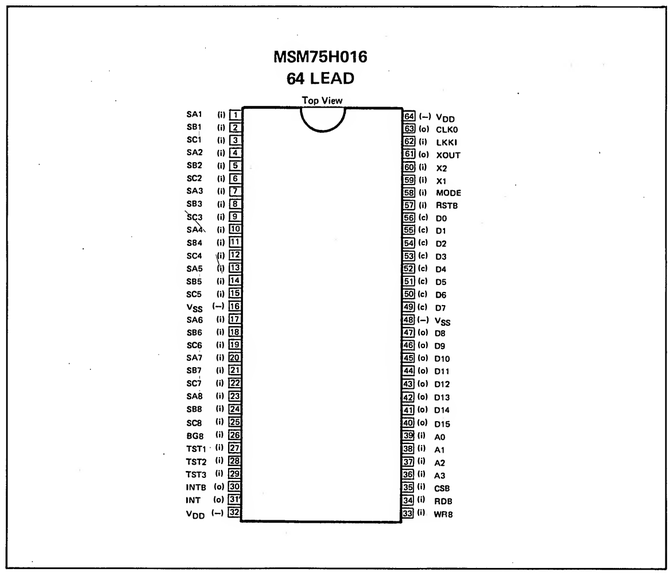
IC DATA

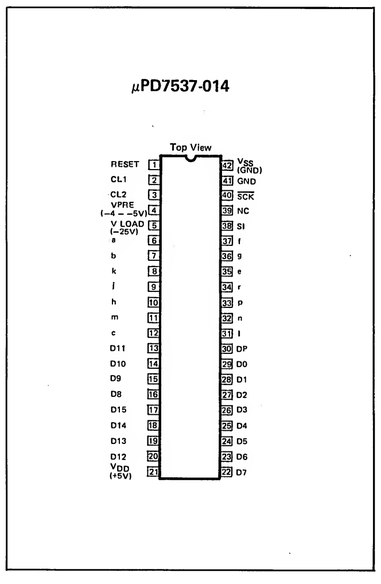


Block Diagram



48-Pin Package





[GR Guitar - MIDI Interface] Date : Nov.11 1986
Model GM-70 MIDI Implementation Chart Version : 1.00

Function ...		Transmitted	Recognized	Remarks
Basic	Default	1 - 16	1 - 16	Memorized
Channel	Changed	1 - 16	1 - 16	
Mode	Default	3,4	3	Memorized
	Messages	OMNI,MONO,POLY	x	
	Altered	**********	x	
Note Number		0 - 127	x	
	True voice	**********	x	
Velocity	Note ON	o 9n, v=1 - 127	x	
	Note OFF	x 9n, v=0	x	
After Touch	Key's	x	x	
	Ch's	o	x	
Pitch Bender		o	x	Range: 1 - 64
Control Change	7	o Volume	x	
	0 - 95	o	x	*
Prog Chenge	True #	o 0 - 127 **********	o 0 - 127 0 - 127	
System Exclusive		o	o	**
System Common	Song pos	x	x	
	Song sel	x	x	
	Tune	x	x	
System Real Time	Clock	x	x	
	Commands	x	x	
Aux Mes- sages	Local ON/OFF	x	x	
	All Notes OFF	o	x	
	Active Sense	x	x	
	Reset	x	x	
Notes		* Any Control Number can be selected. (The value is shown in 7 bits.) ** Dump/Load Int the internal memory. (Roland 'one way' format)		

Mode 1 : OMNI ON, POLY Mode 2 : OMNI ON, MONO o : Yes
Mode 3 : OMNI OFF, POLY Mode 4 : OMNI OFF, MONO x : No

GM-70 MIDI IMPLEMENTATION version 1.00 Nov.11 1986

*** GM-70 MIDI IMPLEMENTATION ***
version 1.00
Nov.11 1986

1. TRANSMITTED DATA

Status	Second	Third	Description	
1001 nnnn	0kkk kkkk	0000 0000	Note OFF kkkkkkk = 0 - 127	*1
1001 nnnn	0kkk kkkk	0vvv vvvv	Note ON kkkkkkk = 0 - 127 vvvvvvv = 1 - 127	*1
1011 nnnn	0000 0111	0vvv vvvv	Volume vvvvvvv = 0 - 127	*1
1011 nnnn	0ccc cccc	0vvv vvvv	Control change ccccccc = 0 - 95 vvvvvvv = 0 - 127	*1, *2
1100 nnnn	0ppp pppp		Program change ppppppp = 0 - 127	*1
1101 nnnn	0vvv vvvv		Channel pressure vvvvvvv = 0 - 127	*1
1110 nnnn	0bbb bbbb	0bbb bbbb	Pitch bender change	*1
1011 nnnn	0111 1011	0000 0000	All NOTES OFF	*1
1011 nnnn	0111 1100	0000 0000	OMNI OFF	*1
1011 nnnn	0111 1110	0000 0110	MONO ON (m = 6)	*1
1011 nnnn	0111 1111	0000 0000	POLY ON	*1
1111 0000	... ...	1111 0111	System exclusive	*3

Notes :

*1 nnnn represents the MIDI channel number assinged to each Branch of A,B,C and D.

*2 Any Control Number can be selected.

*3 Bulk Dump(or Load) the internal memory. See 3.EXCLUSIVE.

* At power-up,
The following message is transmitted to all the Branches.

The mode selected in Patch A 11

The following messages are sent to all the channels.

The current volume value
Program Number set in Patch A 11

* When a new Patch is selected,the following messages are transmitted.

A) Through the previous channel
NOTE OFF for notes have been set to ON
All Notes OFF
Pitch Bender Change : center
Modulation(Control 1) : 0
Volume (Control 7) : maximum (127)
Damper 1(Control 64) : 0
Channel Pressure : 0
OMNI OFF, POLY ON

B.) Through the new channel
OMNI OFF
POLY or MONO

Even if the strings previously played are still vibrating, the Channel Voice messages are not transmitted unless a new string is played after a new Patch is selected.

2. RECOGNIZED RECEIVE DATA

Status	Second	Third	Description	
1100 nnnn	0ppp pppp		Program change ppppppp = 0 - 127	*1
1111 0000	... ...	1111 0111	System exclusive	*2

Notes :

*1 nnnn is the value of Control Channel stored in the System memory.
The value can be changed freely, but the mode is fixed to OMNI OFF.

*2 Bulk Dump(or Load) the internal memory.
(See 3. EXCLUSIVE.)

3. EXCLUSIVE

3.1

3.1.1 Exclusive Description

System Exclusive is used to Dump or Load into the internal memory. The format to be used is Roland's 'One Way Transfer' with 21 bit logical address.

Standard Format (treat this as a block)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0000 nnnn	Device-ID # = control channel where nnnn + 1 = channel #
d 0001 0001	Model-ID # (GM-70)
e 0001 0010	Command-ID # (one way transfer data set)
f 0aaa aaaa	21 bit logical address MSB
g 0aaa aaaa	:
h 0aaa aaaa	LSB
i 0000 dddd	Data bytes
:	
j Deee eeee	Checksum
k 1111 0111	End of System Exclusive

Summed value of the all bytes between Command-ID and EOX must be 00H (7 bits). It does include Command-ID and EOX.

In the GM-70's specifications, Dump (or Load) message is not sent until it is selected through panel operation.
This means that under usual performance condition, the Exclusive is not sent or received.

3.1.2 Data Format

The following are the contents of data transmitted and received.

One Patch Memory(80 bytes)

Address Descriptions

0 - 11	12 letter name. ASCII characters
12 - 15	Undefined(reserved, standard is 0)
16	Branch A, 1st string bit 7:Select(1=ON) bit 6 to 0: Program Change Numbers
17	Branch A, 1st string Transpose
18 - 19	Branch A, 2nd string (the contents of data are the same as the 1st string; 16 and 17)
20 - 21	Branch A, 3th string (the contents of data are the same as the 1st string; 16 and 17)
22 - 23	Branch A, 4th string (the contents of data are the same as the 1st string; 16 and 17)
24 - 25	Branch A, 5th string (the contents of data are the same as the 1st string; 16 and 17)
26 - 27	Branch A, 6th string (the contents of data are the same as the 1st string; 16 and 17)
28	branch A bit 5: 1 = OFF bit 4: 1 = POLY, 0 = MONO bit 3 - 0 : Basic Channel
29	Branch A Bend Range
30	Branch A Velocity Curve
31	Branch A Level
32 - 47	Branch B (the contents of data are the same as the Branch A;16 to 31)
48 - 63	Branch C (the contents of data are the same as the Branch A;16 to 31)
64 - 79	Branch D (the contents of data are the same as the Branch A;16 to 31)

Between two Blocks, An Inter Block Gap(more than 20ms)
is placed to allow low speed receivers to recognize the signals.
The number of the bytes in the above mentioned MIDI messages are
as follows.

all data : 21834 bytes
64 patch : 10880 bytes
system : 74 bytes

3.2.1 Entire Data in Memory

First, the Patch Memory data 1 to 128 is sent, then
the System Memory. The form and logical address of
each Block are as follows.

block-001 (patch 11)
F0 41 0n 11 12 00 00 00 [.data 160bytes.] sum F7
block-002 (patch 12)
F0 41 0n 11 12 00 01 20 [.data 160bytes.] sum F7
block-003 (patch 13)
F0 41 0n 11 12 00 02 40 [.data 160bytes.] sum F7
:
:
block-128 (patch -88)
F0 41 0n 11 12 01 1E 60 [.data 160bytes.] sum F7
block-129 (system)
F0 41 0n 11 12 01 20 00 [.data 64bytes..] sum F7

3.2.2 First 64 Patches

The form and logical address of each Block are as follows.

block-001 (patch 11)
F0 41 0n 11 12 02 00 00 [.data 160bytes.] sum F7
block-002 (patch 12)
F0 41 0n 11 12 02 01 20 [.data 160bytes.] sum F7
block-003 (patch 13)
F0 41 0n 11 12 02 02 40 [.data 160bytes.] sum F7
:
:
block-064 (patch 88)
F0 41 0n 11 12 02 4E 60 [.data 160bytes.] sum F7

Sytem Memory (32 bytes)

Address	Descriptions
0	CV 1 Assign
1	CV 1 Mode
2 - 3	CV 2 (the contents of data are the same as CV 1's)
4 - 5	CV 3 (the contents of data are the same as CV 1's)
6 - 7	CV 4 (the contents of data are the same as CV 1's)
6 - 9	SW 1 (the contents of data are the same as CV 1's)
10 - 11	SW 2 (the contents of data are the same as CV 1's)
12 - 13	FCV (the contents of data are the same as CV 1's)
14 - 15	FS 1 (the contents of data are the same as CV 1's)
16 - 17	FS 2 (the contents of data are the same as CV 1's)
18 - 19	RCV (the contents of data are the same as CV 1's)
20 - 21	RSW (the contents of data are the same as CV 1's)
22	Control Channel
23	Undefined(reserved, standard is 00)
24	Master Tune
25 - 31	Undefined(reserved, standard is 00)

3.2 TRANSMIT

One of the following data groups can be transmitted
through panel operation.

1) Entire memory data
2) First half(64 Patches) of the 128 Patch Memories
(11 to 88)
3) Latter half(64 Patches) of the 128 Patch Memories
(-11 to -88)
4) System Memory

Different address is transmitted depending on which of
the above four data groups is selected.

The data in one Block is transmitted as follows:

1) 1 byte(=8 bits) is divided into two(4 bits each),
transmitted two data groups.

2) A Patch consists of 80 bytes and sent by a block including

160 data bytes.

3) The System Memory consists of 32 bytes and sent by a Block

including of 64 data bytes.

3.3.1 The following conditions should be fulfilled to start
receiving data.

* Roland fromat starts correctly.(If not, the GM-70 will wait until
the correct Block is transmitted.)

*The received Device ID is equal to the Control Channel.
(If not, the GM-70 will wait until the correct Block is
transmitted.)

*The address of the first Block is one of the following.
(If not, the GM-70 shows DATA ERROR in the Display and
returns to the playing mode.)

Address(3 bytes) MSB LSB

Entire Data

First Half Patches(64 Patches)

Latter Half Patches(64 Patches)

System Memory

3.2.3 Latter 64 Patches

The form and logical address of each Block are as follows.

block-001 (patch -11)
F0 41 0n 11 12 02 50 00 [.data 160bytes.] sum F7
block-002 (patch -12)
F0 41 0n 11 12 02 51 20 [.data 160bytes.] sum F7
block-003 (patch -13)
F0 41 0n 11 12 02 52 40 [.data 160bytes.] sum F7
:
:
block-064 (patch -88)
F0 41 0n 11 12 03 1E 60 [.data 160bytes.] sum F7

3.2.4 System Memory Data

Contains only one Block. The form and address are as flollows.

block-001 (system)
F0 41 0n 11 12 03 20 00 [.data 64bytes.] sum F7

3.3 Receive

Enter to the Receive stand-by mode by operating the panel.

*Select whether to receive the first or latter 64 Patchs.
(See 3.2 Transmit, 3.2.2 and 3.2.3.)
This procedure is not necessary when receiving the entire
data of memory.

3.3.2 Depending on the first address received, the GM-70 stores
the data into a proper location in memory. After this, the
following conditions should be fulfilled.

*Roland format being received is correct.
(If not, the GM-70 will wait until the correct Block
is transmitted.)

*The received Device ID is equal to the Control Channel.
(If not, the GM-70 will wait until the correct Block
is transmitted.)

*The next logical address is correct.
(If not, the GM-70 shows DATA ERROR in the
Display and returns to the playing mode.)

* Check Sun is correct. (If not, the GM-70 shows DATA ERROR
in the Display and returns to the playing mode.)

* EOX follows at the end. (If not, the GM-70 shows DATA ERROR
in the Display and returns to the playing mode.)

* The correct number of the Blocks received.
(When less Blocks are received: the GM-70 waits until all
are received.

When more Blocks are tramsmitted, the GM-70
ignores the exceeding Blocks.

3.3.3 Even if the loading goes wrong in the middle, the data
received so far is stored into memory.

3.3.4 Loading can be aborted at any time by pushing any button
on the panel.

3.3.5 The Control Channel resides in the System Memory. Therefore,
the Control Channel (Device ID) is not changed until the
System Memory Blocks is fully received.